Numerical analyst for floating wind turbine sector

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Description of the entity

FRANCE ENERGIES MARINES (FEM), the national research institute dedicated to Offshore Renewable Energy (ORE), supports the nascent ORE industrial sector with the means and skills that increase competitiveness by mutualizing R&D costs, reducing risks and accelerating the acquisition of data and knowledge.

FEM activities are founded on Research and Development projects based on a broad public-private partnership involving large groups, SMEs, regional authorities, advanced research and training institutions and competitiveness clusters, and with the support of the national Investing for the Future program. FEM collaborators are scientifically and technically involved in these projects thanks to their high level of scientific expertise.

FEM is now established on 3 sites: the headquarters is located in Brest, and two branches are located in Marseille and Nantes.

Description of the position

As part of its program "Design and monitoring of ORE systems", FEM is looking for a numerical analyst in the field of floating wind power. The position is opened for a research engineer / doctor (e) in applied mathematics specialized in industrial engineering in order to ensure the development of this competence through collaborative research projects in a mixed industrial / academic context. This research program covers a wide spectrum of skills, including structural mechanics, hydrodynamics, thermal engineering, electrical export components, power transformers, control law, etc. MRE is a fast-emerging sector. Optimising and de-risking the technologies developed will increase the competitiveness of the produced electricity. Learning curve of the pilot’s deployment is fundamental and takes shape thanks to the analysis of measured data, using those data to increment the digital models for design and monitoring. The candidate will be responsible for the smooth running of this theme, its development and will participate in the collaborative research projects thus generated.

Within the R&D team, the candidate will contribute to the development of expertise in applied mathematics within this research program by working on the FEDER SUBSEE4D project. The SUBSEE4D project aims to facilitate the operation of floating wind farms by developing a digital twin solution; a real supervising manager allowing to optimize and plan the maintenance operations but also contributing to the reliability of the submerged systems thanks to the reduction of the uncertainties of fatigue life allowance and the optimization of their sizing. FEM is in charge of the software programming of the in-service monitoring module for mooring lines and their dynamic behaviour. The FEM team brings to the project its knowledge of the offshore environment, both in terms of design methods for moored floating systems as well as installation constraints and underwater inspection conditions. FEM also brings its expertise in software development, in particular at the level of standard procedures and rules of good practice for IT development.
In this context the candidate will be involved within four main areas of action, in close collaboration with FEM internal experts:

- Carry out a realistic modelling of the floating wind turbine and its mooring lines from existing models, implementing complex material behaviour laws. It is also required to master temporal and frequency approaches of numerical calculations by finite elements.

- Provide expertise on statistical, probabilistic models and numerical estimation methods for variables estimation and related uncertainties. These skills will be directly applied to the SUBSEE4D project, which targets to improve the estimation of the fatigue life of the mooring components as well as the related alert systems using machine learning techniques. The candidate will work in close collaboration with a post-doctoral student in applied mathematics in charge of the development of the surrogate-model. The role of the candidate is to ensure the physical consistency of the surrogate-model from the learning phase to the validation phase.

- Take an active part in the IT developments of the in-service monitoring module of the mooring lines, in collaboration with the project team. This will involve developing and testing prototype tools for automated data processing; participate in the definition and evaluation of learning datasets.

- Ensure a technology intelligence in its area of expertise in order to ensure the relevance of FEM’s fields of investigation. She / he will participate in the communication of the know-how of the institute through publications and participation in conferences and will lead the internal reflections of the institute on this topic.

The responsibilities of this position are defined within the projects but also within internal consulting activities for the FEM team on numerical / statistical methods and signal processing:

- Participate in the implementation of simulation models;
- Ensure sufficient autonomy to interact technically with the partners of the SUBSEE4D project;
- Lead an internal consulting activity on transversal projects calling on its area of expertise;
- Identify and submit publications to well-known scientific conferences ensuring good visibility of the MRE sector, in particular in the offshore field;
- Identify development path of research activities but also of service to contribute to the evolution of the institute’s strategic roadmap on this theme.

**Supervision**

The candidate will be under the responsibility of the "Design and monitoring of ORE systems" program manager.
Qualifications, skills and experience required

With a higher education in mathematics applied to industrial engineering, holding an engineering degree and / or a doctorate, you have at least 3 years of experience in research, in a design office or within a industrial company, preferably in the offshore or naval field.

You are versatile and have the ability to implement multidisciplinary approaches. You have the qualities required to carry out multidisciplinary studies in a scientific and industrial research environment.

**Essential:**
- Engineering degree or doctorate in mathematics applied to mechanics or hydrodynamics;
- Statistical models (Markov method, ...), probabilistic (Bayesian approach, ...), learning, interpolation and extrapolation (kriging, ...) and optimization model;
- Proficiency in python, back-end IT development and debugging;
- Signal processing methods;
- Temporal and frequency approaches;
- Good command of English.

**Desirable:**
- Experience in the offshore or naval field.

Candidate Profile

- Recognized scientific rigor;
- Proactive spirit and multidisciplinary openness;
- Taste for applied research (industry);
- Ease of expression, argumentation and communication in a partnership context;
- Ability to share strategic vision.

Practical Information

Type of contract: 18-month fiex-term contract
Starting date: November 2020
Deadline for application: 6 November 2020

Please send your CV and cover letter to the following address: contact@ite-fem.org

For more information on this position, contact romain.ribault@france-energies-marine.org or guillaume.damblans@france-energies-marines.org

In the event that the candidate is made available by a member of France Energies Marines, the application must mention the agreement of the current employer.